DOCUMENT RESUME

ED 023 605 SE 005 422

By-Brainard, Robert W.
Science Policy Bulletin, Volume 1, Number 6.
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
Pub Date Aug 68
Note-50p.
EDRS Price MF-$0.25 HC-$2.60
Descriptors-Annotated Bibliographies, *Bibliographies, Conference Reports, Engineering, Federal Aid, Federal Government, Financial Support, Foreign Countries, Higher Education, Industry, *Research, *Sciences, Scientific Manpower, Social Sciences, Socioeconomic Influences, *Technology

This bimonthly bulletin reports the current literature in the area of science and public policy. Coverage encompasses both "policy for science" and "science for policy" matters. "Science" is used to denote engineering, technology, and science. The bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. Information presented consists of bibliographic listings of current publications in the area. Major meetings and other events in the subject area are reported. Publications of a highly technical and narrowly specialized nature are excluded. Information is presented under topical categories. The numbering of publications runs consecutively through all issues so that a given number refers to only one citation. (BC)

Vol.1 Number 6
August, 1968

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Science Policy Bulletin

Battelle Memorial Institute

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SCIENCE POLICY BULLETIN

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The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation.

Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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BIBLIOGRAPHY

I GENERAL

108. "National Science Foundation -- 1967 Annual Report", NSF-68-1, U.S. Government Printing Office, Washington, D.C., 1968, 219 pp.

"This 17th Annual Report of the National Science Foundation presents an account of major activities, and reports on funds obligated for support of science and science education in fiscal year 1967". The bulk of the report is devoted to a description of NSF's research-support activities, science education, institutional programs, science information, international science activities, and science policy planning. In connection with the latter, the recently-created Office of Planning and Policy Studies will undertake studies "of specific policy issues and formulation of plans for science both of a national character and pertaining to the Foundation's own programs"; two extramural studies currently underway are aimed at determining "whether any practical analytical methods of assessing [the merit of] proposed science support programs exist which can be used in conjunction with the use of expert opinion".

109. Falk, C.E., "Science and Public Policy Activities in Universities", Bulletin of the Atomic Scientists, v. 24, no. 6, June 1968, pp. 50-52.

The author, who is Director of Planning for the National Science Foundation (NSF), discusses the status of science and public policy as a discipline, notes the education and research needs of the area, and reviews NSF's interests and programs in the field. After citing the need for training in both the social and natural sciences as prerequisite to work in the field, Falk notes that few science "experts" have such experience and that very few universities have programs that meet these needs. He describes the initial efforts being made by NSF to remedy the situation, with special attention to the "University Science Planning and Policy Program" which supports research and initial planning efforts for integrated programs in the field. Illustrations are presented of the types of projects and study areas to be supported under this program, which is currently funded at about $500,000 per year.

110. "Applied Science and World Economy", A Compilation of Papers, Prepared for the Ninth Meeting of the Panel on Science and Technology, Committee on Science and Astronautics, U.S. House of Representatives, U.S. Government Printing Office, Washington, D.C., February 1968, 92 pp.

The papers in this collection deal collectively with the economic, social, and technical aspects of technology, including its advancement and application. Individual papers deal with such topics as the effects of technological change on the world market, the development of new technology and its transfer, the reciprocal relationships between education and technology, and the actual and optimum use of scientific and technical resources. The authors include: Barbara Ward, A.T. Knoppers (Merck & Co.), W.J. Hesse (Ling-Temco-Vought Aerospace Corp.), O.M. Solandt (Science Council of Canada), J.A. Sabato (National Commission for Atomic Energy of Argentina), A. King (Organization for Economic Cooperation and Development), and M. Goland (Southwest Research Institute).

111. Seymour, S.F., (Ed.), Washington Colloquium on Science and Society, First Series, Mono Book Corp., Baltimore, Maryland, 1967, 181 pp., $6.50.

This book is a collection of the proceedings of the Washington Colloquium on Science and Society held during 1964-1965 at the American University. It consists of individual papers, discussants' comments, and question-and-answer exchanges. The papers attempt to examine systematically and objectively questions in science and policy "rather than to take a particular stance on any particular or general science policy". Contents:

- "The Recovery of Nerve: Some Implications of the New World of Science and Technology" (Emmanuel G. Mesthene)
- "Further Reflections on the Triple Revolution" (W.H. Ferry)
- "Effect of Technology on the Free World's Access to and Acquisition of Raw Materials" (William Y. Elliott)
- "Science as a True Mythology" (David Hawkins)
- "Science, Technology, International Law and International Accommodation" (Howard J. Taubenfeld)
- "Modern Science and Shifting Political Power" (Hans J. Morgenthau)
- "Some Moral Problems Posed by Modern Science" (Warren Weaver)
- "Are Scientists Qualified to be Science Advisors?" (Stephen Toulmin)

112. Leeds, M., (Ed.), Washington Colloquium on Science and Society, Second Series, Mono Book Corp., Baltimore, Maryland, 1967, 201 pp., $6.50.

This book is a collection of the proceedings of the Washington Colloquium on Science and Society, held during 1965-1966 at Georgetown University. Various facets of the colloquium's theme -- "Changing Man in a Changing Environment" -- are examined in the eight papers of this collection. This book, as in the First Series, consists of papers, discussants' comments, and question-and-answer exchanges. Contents:

- "Science and Society -- Problems of Today and Tomorrow" (Frederick Seitz)
- "Some Scientific Problems of International Development" (Roger Revelle)
- "Changing Man in a Changing Environment" (Frank Fremont-Smith)
- "The Population Explosion: The Impact of Man on Man" (Philip M. Hauser)
- "Fewer Facts: More Theory" (Jacques Barzun)
- "Science and the Congress" (Emilio Daddario)
- "Some Social Meanings of Communications Science and Technology" (William O. Baker)
- "The Impacts of the New Technology on the World Economy" (Peter F. Drucker)

113. Wenk, E., Jr., "Science in Troubled Times", Address to the Second International Liquid Crystal Conference, Akron, Ohio, 13 August 1968, 12 pp.

The "growing dislocation" between science and society is discussed, and steps are suggested for closing the cleavage. The author--who is Executive Secretary of the National Council on Marine Resources and Engineering Development--suggests that current social unrest is causally linked to rapid scientific and technical developments. Although "science and society are not intrinsically headed in different directions, they are not mutually reinforcing" at present because of the lack of people and institutions to "blend the two cultures". Further, "science itself is in trouble"; behind the current Congressional cuts in research support is a rising public "disillusionment" with science. Steps proposed for mending the science-society cleavage include better public communication of the implications of science, less specialization in higher education, and interdisciplinary institutions for transforming "the fruits of science" into "a technology and a program suitable for social and political action".

114. Jevons, F.R., "Politicians and Scientists", Physics Bulletin, v. 19, February 1968, pp. 42-25.

Some of the principles and problems underlying the relationship between scientists and politicians, and their attitudes toward each other, are discussed. Scientists have been said to approach policy issues with the belief that the methods of natural science can yield an objective solution; from an examination of certain policy documents in the early history of the atomic bomb, the author concludes that if anyone thought this, "it seems to have been the politicians rather than the scientists". The intermingling of technical and political considerations and the difficulty of "presenting the facts genuinely unslanted" are discussed in the context of disarmament negotiations; here, where scientists have been criticized as "amateur diplomats", the author sees the tendency to overestimate the separability of the technical from the political. The problem of evaluating conflicting advice from experts, and of means for balancing their biases, is discussed. Finally, the author reviews some of the aspects of science, per se, to show that "it is not a purely rational process", and to dispel the conception of infallibility that non-scientists sometime attach to science.

115. Jenks, C.W., "The New Science and the Law of Nations", International and Comparative Law Quarterly, v. 17, Part 2, Fourth Series, April 1968, pp. 327-345.

The impact of science and technology on the "law of nations" is described, and the measures needed in legal education, research, and action to cope with the impact are discussed. The author, who is Principal Deputy Director-General of the International Labour Office, sees "the impact of science and technology on man" as the "greatest problem of our time". He warns that unless the law becomes equipped "to serve as the accepted social discipline of science and technology", it will "lose its status in society and cease to be an effective force in the control of social conduct". The status and prospects of legal research and action in several areas are discussed: control of nuclear energy, space activities, environmental pollution, polar regions, supersonic flight and boom, weather and climate modification, earth-probing operations, and cybernetics. In addition to specific treaties, the author calls for a "comprehensive approach to the problem as a whole" that would include a "Declaration of General Principles Dedicating Science and Technology to the Service of Man", followed by a "World Science Treaty" defining "the mutual obligations among States arising from the impact of science upon society".

116. "Institute for the Future", The Futurist, v. 2, no. 4, August 1968, pp. 65-69.

An Institute for the Future (IFF) has been formed "for assessing the long-range consequences of today's key planning and programming decision, for forecasting social and economic trends and for ... identifying workable departures from established trends". The Institute, to be located in Middletown, Connecticut, has "initial support totaling more than $1 million"; funding has come from the Ford Foundation and other private sources, supplemented by $250,000 from the Connecticut Research Commission. The core activity of IFF will include an "Annual Future State-of-the-Union Report", efforts to "adapt engineering and operations research techniques to the social sciences", and a simulation facility for studying the "urban development of economically-retarded nations". Besides its core activities, IFF will select other research areas such as "Cities Tomorrow", "Future Education", and "Feeding the Masses". The Institute, headed by Frank P. Davidson, will offer its socio-economic services both in the U.S. and abroad.

117. Mueller, M., "APS to Stay Aloof from Politics", Science, v. 160, no. 3839, 26 July 1968, p. 340.

After debating for a year, the American Physical Society (APS) has rejected the "Schwartz Amendment" that would have allowed the society to discuss and pass resolutions "having political and social implications beyond pure physics". The proposed amendment, which "was an attempt to involve the society in the discussion of the Vietnam war and other political issues", was rejected by a 2 to 1 vote of the APS membership. APS's constitution now limits its activities to "matters of direct professional concern to physicists". The debate over the amendment "began when the editors of Physics Today, an American Institute of Physics journal, refused to publish Schwartz's letter on the morality of the Vietnam war; they said the letter did not have any relation to pure physics". Schwartz (a University of California associate professor of physics) then circulated a petition for amendment of the APS consitution to allow political and social debate.

8. National Science Policies of the U.S.A.: Origins, Development and Present Status, United Nations Educational, Scientific and Cultural Organization (UNESCO), August 1968, 170 pp.

This report, prepared for UNESCO by the U.S. National Science Foundation, is a general survey of U.S. science policy. The report, which appears to be designed primarily

to inform foreign audiences, emphasizes that the U.S. has a "constellation of science policies" rather than a single policy. This constellation, the report says, has "evolved largely in ad hoc fashion in response to perceived challenges to national security and prestige or in pursuit of national welfare, educational development and improved international relations". The report places special emphasis on the search for new ways that science can support economic and social goals. Following an historical introduction, the report describes the political and economic factors influencing policy; the mechanisms for policy implementation; the role of governments (federal and local), industry, universities, and nonprofit institutions; the development and utilization of scientific, professional, and technical manpower; and national science policy issues. (The latter are discussed under the headings of organization, economic and social issues, the role of R&D in economic growth, allocation problems, social, educational issues, and international issues). The report presents numerous tables and charts on human and financial resources involved in R&D, and an eight-page selective bibliography. (Copies of the report are available from the UNESCO Publications Center, 317 East 34th Street, New York, N.Y. 10016. Price: $3.50)

119. Brooks, H., The Government of Science, M.I.T. Press, Cambridge, Massachusetts, January 1968, 343 pp., $10.00.

This is an edited collection of 11 papers dealing with various aspects of science and government, with special attention given to policies for the support of research. Brooks collects in this volume some of his essays and speeches prepared during 1960-1967 "when [he] was closely associated with 'science policy' in the executive branch of the federal government". The papers, most of which have been published previously, deal with such issues as: the arguments for and against a department of science; arguments and criteria for federal support of university research; new technology in meeting educational needs of the future; the role of national science policy in maximizing technology transfer and spurring innovation; the function of basic research supported by mission-oriented agencies; strategies for allocating research resources; and the penetration of ideas and styles of thought derived from natural science into the general culture.

120. Roman, D.D., Research and Development Management: The Economics and Administration of Technology, Appleton-Century-Croft, New York, 1968, 450 pp., $10.00.

This book attempts to identify and synthesize the operational characteristics, organization and structure of

R&D in the U.S. Although intended primarily as a text for college courses in R&D management, the book treats many aspects of national science policy. These include such topics as the scope and character of government-supported R&D, the impact of defense R&D expenditures on the economy, technology "fallout", the geographic distribution of R&D, government organization for the management of scientific activity, and the evaluation of R&D on a national basis.

121. "Virginia to Study Science Influence", Scientific Research, v. 3, no. 12, 10 June 1968, p. 23.

The National Science Foundation (NSF) has granted the University of Virginia $41,000 to establish "a center to study the relationship between science, technology and public policy". This is the first integrated program sponsored by NSF "designed to encompass all the problems of the impact of science on society, including research and the training of graduate students". The program's main objective is "to experiment with interdisciplinary research as an approach to the understanding and solution of problems concerned with science and society". The center, which is under the direction of Mason Willrich, begins officially July 1, although some projects are already underway. These include: "a study of national policy alternatives concerning nuclear energy"; "a comparative study of research organizations in selected countries"; and "an inquiry into the ways in which science and technology can be employed to deal with urban problems". NSF "expects to spend a total of $250,000 this year to develop other university centers for studies like that at Virginia".

122. Science Policy Research Unit: First Report 1967, The University of Sussex, Lancaster House, Falmer-Brighton-Sussex, England, 1967, 22 pp.

The Science Policy Research Unit at The University of Sussex was established in 1966, with the aim of contributing "through its research to the advancement of knowledge in the sphere of science policy and especially to a deeper understanding of the complex social process of research, invention, development and innovation". The Unit "undertakes a substantial amount of research under contract or on a consultancy basis for government and international agencies as well as for industrial organizations". The Unit, in addition, contributes to undergraduate teaching and is involved in the training of visiting research fellows, and certain "other post-graduate courses in History, Philosophy and Social Studies of Science". Principal areas of current research include: "Historical Studies of the Endowment of Science"; "International Comparisons of

[R&D] in Relation to International Trade Patterns and Studies of the 'Technology Gap' in the OECD area"; "Science Policy in Developing Countries"; and "Patterns of Discovery, Invention and Innovation". (For further information, write Professor Asa Briggs, Chairman of the Unit, or Christopher Freeman, Director of the Unit, at The University of Sussex, Lancaster House, Falmer-Brighton-Sussex, England).

123. Caldwell, L.K., and DeVille, W.B., Science, Technology, and Public Policy: A Syllabus for Advanced Study, Department of Government, Indiana University, Bloomington, Indiana, 1968 250 pp.

This syllabus is intended as a guide "to the study of selected major aspects of public policy for science and technology, and the impact of science upon public affairs". The syllabus, prepared with the assistance of a grant from the National Science Foundation, is divided into three major sections: Science and Technology as Social Forces; The Organization of Science and Technology; and Policy Problems of Science and Technology. Each section is divided into topical areas, each of which contains a brief introduction to the topic, selected basic readings, a topical outline (with a reference key), a bibliography of general references, and a list of "leading questions". "The material contained in this syllabus is presented as a course appropriate to graduate or upper-division undergraduate instruction"; it is "also adaptable to self-instruction.

124. de Reuck, A., Goldsmith, M., and Knight, J. (Editors), Decision Making in National Science Policy, A CIBA Foundation Symposium, Little, Brown and Co., Boston, Massachusetts, 1968, 310 pp., $12.00.

This book is the proceedings of a 1967 symposium arranged jointly by the Ciba Foundation and the Science of Science Foundation. "The intention in convening this symposium was to discuss both the practice and principles underlying the selection of priorities and the criteria for allocating resources ... to scientific research". Although the central theme is decision making at a national level, attention is also given to industrial decision making and to the extension of national science efforts by international cooperation. The proceedings consist of some 15 papers, with associated discussions, organized into sections dealing with the evaluation of research productivity, science policy in mixed economics (France, Sweden, U.S.A., and Canada), science policy in planned economics (U.S.S.R., Hungary), and science policy in developing countries (Latin America, India, and Israel).

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

81. "Will R&D Save Our Cities?", Industrial Research, v. 10, no. 16, June 1968, p. 30.

This brief article reviews some of the R&D plans and programs of the Department of Housing and Urban Development (HUD). Priority areas include: volume production of low-cost housing; study of the social and behavioral problems associated with housing lower income families; the "Model Cities" program; improving urban planning and administration; and an information exchange network. Briefly mentioned is a current study being conducted for HUD (and the Department of Defense) by the Institute of Defense Analysis on low-cost housing and how to achieve it; a related program is examining the "opportunities and obstacles to the rapid injection of large quantities of low-cost housing". In addition, summer studies with universities are being explored as a means for dealing with some of the agency's problem areas. HUD's activity "adds up to an interesting beginning, but it is not really clear that technological solutions are relevant to the problem, or even in any great demand".

82. "Pennsylvania Awards More than $1 Million in R&D Contracts", Chemical & Engineering News, v. 46, no. 28, 1 July 1968, p. 14.

Pennsylvania's new Science and Engineering Foundation has awarded its first R&D contracts. The contracts totaling about $1.5 million were spread among 13 research institutions and centers in the state. The foundation, set up earlier this year by Governor Shafer, "is aimed at attracting the best scientific and engineering brains needed to help solve the state's serious environmental problems". Fields to receive special attention from the foundation are biomedical research, pollution-abatement methods, oceanography, color physics, ceramic processing, and polymer sciences.

83. "Agencies Support Studies of Science in Nine State Governments", Press Release, NSF 68-140, National Science Foundation, Washington, D.C., 20 June 1968, 2 pp.

The National Science Foundation and the Economic Development Administration (EDA) of the Department of Commerce are supporting a project aimed at "determining how state

and local governments obtain advice and research decisions involving scientific and technical matters". The project, consisting of separate studies of nine different states, has a total funding of almost $60,000. The specific aims of the studies are to: "discover how state governments have sought to promote science and technology; "analyze the advantages and disadvantages of various organizational arrangements established by state governments" to promote and use research; and provide information to local governments that will assist them in establishing science advisory units.

84. "Fiscal Year 1967 and 1968 Federal Expenditures on Research, Development, and Demonstration Related to Pollution", Prepared by the Research, Development, and Demonstration Subcommittee, of the Federal Council for Science and Technology's Committee on Environmental Quality, Washington, D.C., 6 May 1968, 18 pp.

This report is the first survey and analysis of the federal government's support for research, development and demonstration programs related to environmental pollution. It presents 1967 and 1968 expenditure data, both intramural and extramural, for 12 government departments and independent agencies. The data are detailed as to expenditures "on the effects of pollution, transport and fate of pollutants, measurement and instrumentation, and sources of pollution, as well as information on the social, legal and economic aspects and control of pollution". The results of the survey "will be used to determine what is being done; to assess in some measure the balance of the programs; and to evaluate priorities". (Additional information is available from Dr. Donald R. King, Executive Office of the President, Office of Science and Technology, Executive Office Building, Washington, D.C. 20506).

85. Nelson, B., "Congress: Toward a National Policy for the Environment", Science, v. 161, no. 3840, 2 August 1968, pp. 445-446.

A House-Senate colloquium on 17 July discussed the need for a national policy for the environment and considered some of its elements. Among the suggestions offered were: creation of a Council of Ecological Advisers; a "vehicle to facilitate communication between the scientific community and public environment"; and a "national commission on the environment". Donald Hornig, the President's science adviser, was "skeptical about ... creating a new organizational entity to deal with environmental problems", and instead thought that "a strengthening of staff capacity at the Executive Office level was 'at least as

attractive'". Interior Secretary Stewart Udall "argued that the basic question was one of funding: 'Are we willing to pay for a quality environment?'". Although the colloquium agreed that much more action is needed, and needed quickly, no clear plan emerged; a second meeting is planned for early next year.

86. Weidenbaum, M.L., "Long Term Impacts of Big Technology", Washington University, St. Louis, Missouri, February 1968, Supported by NASA Research Grant NSF-342. Available from Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce, National Standard Bureau of Standards, Springfield, Va., N68-18130, 15 pp.

Some of the negative aspects of federally-funded big technology are examined along with their policy implications. The "close, continuing relationship" between the government (mainly DOD and NASA) and its suppliers of big technology (mainly aerospace and related high-technology industries) is producing a convergence between the two, in which government is taking over the "decision-making functions ... normally the prerogatives of business management". The author describes and illustrates the convergence, presents data showing the differences between government-oriented and market-oriented industries, and considers its long-range impact. As for policy implications, the author questions the frequently-made proposal that the defense industry apply its R&D and management talents to the civilian sector: "would it be wise ... to expand that ... industry which increasingly develops the characteristics and mentality of a government arsenal?". He also calls for changes in government procurement policies "to halt the erosion of the ... entrepreneural character of the firms that undertake" large R&D programs for the government.

87. "New Computer Science and Engineering Board", Science, v. 160, no. 3834, 21 June 1968, p. 1321.

The National Academy of Sciences has established a board to study the impact and implications of the usage of data-processing technology. In establishing the board, Academy President Frederick Seitz said, 'The Board's assignment will be to assess the implications of the enormous and somewhat heterogeneous growth of information-processing technology as it affects the public and private sector of our nation'. The board will be headed by Anthony G. Oettinger (professor of linguistics and applied mathematics at Harvard University's Aiden Computation Laboratory); its 12-man membership will be drawn from academic and industrial experts in computer and information science.

88. Carpenter, R.A., "Federal Policy and Environmental Chemistry", Environmental Science and Technology, v. 2, no. 7, July 1968, pp. 518-523.

This article reviews federal policies for restoring and maintaining environmental quality and discusses the roles of science and the chemical industry in pollution abatement. The author, who is a member of the Science Policy Research Division of the Library of Congress Legislative Reference Service, states that the "accepted goal today is to restore and maintain a quality of the environment without disrupting our economy and culture". In the case of "gross and obvious contamination", "there is a tendency to leapfrog immediately into an abatement plan"; for the more subtle pollutants, "a more convincing, scientifically established reason to spend money for abatement" is required. "The recognition of the errors in cost-effectiveness judgment which can accompany a leapfrogging policy has led the Congress to a sequential approach in setting standards." As for the role of science, "legislation ... has placed an obligation on science to provide a sound, legally-useful basis for the [control of] subtle pollutants which our senses cannot evaluate". Six areas for "action and response to federal policies" are identified for the chemical industry.

89. "Daddario Criticizes Part of HEW Reorganization", Chemical & Engineering News, v. 46, no. 27, 24 June 1968, p. 12.

In a recent reorganization of the Department of Health, Education and Welfare, the National Center for Air Pollution Control was grouped with consumer protection services under the Public Health Service (PHS). Locating pollution control there "is a step in precisely the wrong direction", contends Rep. Emilio Daddario, whose subcommittee (on science research, and development) has just completed a study which concluded that 'progress toward clean air is slowed because of the [PHS] preoccupation with human health effects'. 'Legally useful cause and effect relationships may be so difficult to establish that other bases for abatement action must be used'. The subcommittee's study concluded that 'the quality of the environment is not a human health issue, per se'; 'It is more a matter of the unacceptability, at face value, of offensive odors, discolored water, low visibility, eye irritation ...'. Also called for by the study is a national policy for the environment; coordination of allocations and priorities in federal R&D for pollution abatement by the Office of Science and Technology; and a restructuring of the federal establishment for 'environmental engineering management'.

90. "Contributions of Science and Technology to Federal Crime Insurance", Report prepared for the Select Committee on Small Business, U.S. Senate, By the Science Policy Research Division, Legislative Reference Service, Library of Congress, (10 August 1968), Ninetieth Congress, First Session, U.S. Government Printing Office, Washington, D.C., 1967, 175 pp.

This report considers the extent to which a proposed Federal Crime Insurance Corporation might utilize science and technology to reduce the costs of crime. The report reviews the incidence of crimes affecting commercial establishments and other small businesses, the costs of crime, and details of the proposed federal crime insurance program. Science and technology, the report concludes, can be applied to reduce crime through (a) use of operations research techniques in police departments, (b) improved protective hardware, and (c) better utilization of available prevention techniques. "The most urgent need of a national program against crime is to amass reliable knowledge about all aspects of criminal behavior". Various appendices provide information on federal flood insurance, military security practices, legislation before Congress relating to crime, and a bibliography on compensation for crime victims and material on protection of business against crime.

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

71. Seitz, F., "After Vietnam -- Will Science Regain Support?", Scientific Research, v. 3, no. 12, 10 June 1968, pp. 28-29.

> "[T]he budgetary crises in science might easily continue into the post-war period, unless the scientific community ... can persuade the public that our first commitment is to public service". Lack of a public commitment to the pursuit of basic knowledge and the press of domestic needs are cited as factors weighing against the resumption of a rapid growth in science funding. The author (president of the National Academy of Sciences) foresees the possibility of basic science being supported only by the National Science Foundation, under a relatively fixed budget. Other topics discussed include: the need for geographical distribution of research support ("Congress is not going to fund programs indefinitely without some concern for equity"); the relation between research and education; the decreasing proportion of people going into physics and engineering; and the "growing [public] disinterest in innovation".

72. Small, W.E., "A Crisis Within a Crisis", Scientific Research, v. 3, no. 13, 24 June 1968, pp. 19-20, 23-25.

> "Physics research in the United States is in trouble. And the National Science Foundation, traditionally the load-leveler in federal support of basic research, is threatened this year with a 20 percent cutback ...". After citing the recent cutbacks in support of physics by the Atomic Energy Commission (AEC), NASA, and the Department of Defense (DOD), the article reviews the scope and status of NSF's physics programs in education, facilities, and research. The problem will become even worse, according to Charles Falk (NSF's Planning Director), and not just in physics, but "across the physical sciences" unless additional funds can be found to replace those being cut from the AEC, NASA, and DOD.

73. "House Cuts Exchange Budget", Science, v. 160, no. 3833, 14 June 1968, p. 1206.

> "The House cut by one third ... from a requested $45 million to a final $30 million ... the appropriation for the Department of State's educational and cultural exchange

program". Reasons cited by the Appropriations Committee for the cut -- the largest the program has suffered -- included "the present financial situation" and "efforts to discourage ... traveling abroad". The Senate has yet to act on the appropriation.

74. "The Status and Problems of High-Energy Physics Today", Science, v. 161, no. 3836, 5 July 1968, pp. 11-19.

This report, prepared by the High-Energy Physics Advisory Panel of the Atomic Energy Commission, reviews the present status and problems of high-energy physics in the U.S., and, in particular, the impact of the recent budget restrictions. The Panel contends that "if present trends are permitted to continue, the U.S. effort is going to suffer serious setbacks, which will have grave consequences for science and education in our country". To remedy the situation, the Panel recommends (1) a substantial increase followed by moderate growth in the annual operating budget for high-energy physics; (2) construction of the electron-positron storage ring at SLAC and of the 14-foot (4.2-meter) bubble chamber at Brookhaven; (3) authorization for constructing the 200-Bev accelerator in fiscal year 1969; and (4) sufficient flexibility in the budget planning to permit possible U.S.-U.S.S.R. collaboration at Serpukhov.

75. Hosmer, C., "What Ever Happened to Federal Funds?", Physics Today, v. 21, no. 6, June 1968, pp. 23-27.

The "cozy relationships between the physical sciences and the federal treasury is on the rocks. And the situation is likely to worsen before it improves". The author (who is a ranking member of the Joint Committee on Atomic Energy) analyzes the trends in federal science funding, and points out that because R&D accounts for almost half of the "controllable" portion of the federal budget, it "is in a highly competitive funding area". The leveling off and change in emphasis of R&D spending is discussed, and some public relations suggestions are offered the scientific community for reversing the current trends. The problems facing "big science" are discussed, together with the need for national laboratories to take on new missions, or be "retired". The article concludes with some alternative futures for the Atomic Energy Commission: unless it "develops some function such as ... a general-services administration for major scientific programs, it could pass into history like the Brooklyn Navy Yard ...".

76. "A Matter of Opinion: Rep. Emilio Quincy Daddario", Scientific Research, v. 3, no. 13, 24 June 1968, pp. 36-40.

This article -- the text of a House speech by Daddario on 5 June -- criticizes the recent and pending cuts in government funding of research and urges a higher national priority for support of R&D. Of special concern to Daddario is the "irrational and sometimes emotional budgetary attack upon certain endeavors of government simply because they are not aimed at producing a specified, tangible product. It is clear that basic scientific research has been placed ... in this category". Daddario reviews the current cuts in R&D support, with special emphasis on the 20 percent reduction in the National Science Foundation's budget and discusses the increased need for research for dealing with various domestic and urban problems. He believes that the budget cuts are "largely temporary and economically induced" and reflect a thoughtlessness on the part of Congress rather than disenchantment with basic research itself.

77. Greenberg, D.S., "Budget Cuts: Government Agencies Prepare to Reduce Spending", Science, v. 161, no. 3837, 12 July 1968, pp. 143-145.

The Bureau of the Budget (BOB) has directed all federal agencies "to draw up plans for reduced spending ... and hold back on making new commitments" to meet "cuts required by the tax bill". Under the latter, $6 billion must be cut from the amount the administration planned to spend in fiscal year 1969. Agencies will allocate cuts differently: NSF cuts will be allocated by institution, "and grant-by-grant cuts will then be worked out within the institution"; and NIH will "negotiate reductions with each grantee". Donald Hornig, the President's Science Advisor, and the BOB agree that "a high priority has been given to protecting graduate training". Hornig "did not sound happy about what may lie ahead ... but he seemed equally unhappy" that the reaction of some scientists to the funding cuts "has been hysterical". Even if the worst happens, the U.S. 'will still have the highest per capita expenditure' on R&D in the world, according to Hornig.

78. "Atomic Energy Commission Funds Slashed", Science, v. 160, 10 June 1968, p. 1321.

The House Appropriations Committee has drastically cut funds for the Weston 200-BEV accelerator and the nuclear rocket engine development programs. The committee approved only $7.1 million of the $25 million requested by the Atomic Energy Commission (AEC) for constructing the accelerator; this will provide "for continuation

of the engineering and design work only during fiscal 1969". The subcommittee was reluctant to "provide funds which would initiate construction at this time of a project with a total estimated cost of $250 million". Some $41 million was also cut from AEC's proposed $72 million to develop a rocket engine; $31 million, however, was allowed for the "advanced rocket reactor technology program and the nuclear rocket development station operations".

79. "Foreign Research Dollar Drain", Hearing before a Subcommittee of the Committee on Government Operations, House of Representatives, Ninetieth Congress, Second Session, (10 April 1968), U.S. Government Printing Office, Washington, D.C., 1968, 80 pp.

This hearing took "another look at the foreign research expenditures by the Government" which are currently running at about $20 million annually. The subcommittee criticized the limited action taken by the Government to reduce these expenditures and called for further cuts as a means of improving the U.S. balance-of-payments. Generally, the subcommittee did not question the value of the research, but did urge that it be delayed or conducted in the U.S. William Carey of the Budget Bureau pointed out that obligations for such research were $19.3 million in 1969 (down from $26 million in 1966) and estimated a further reduction to $15-16 million next year. Most of the hearing was spent on examining small, specific projects and the criteria for their support. Appendices to the hearing present executive directives aimed at reducing foreign research spending, policy criteria for selecting projects to be supported, and information on specific projects brought up in the hearing.

80. "Plow Lease Money Back Into Sea, Say Senators", Ocean Industry, v. 3, no. 8, June 1968, p. 82.

Two Senate proposals have been made to reinvest a portion of government revenues from marine oil operations into oceanographic research. Sen. Warren Magnuson has introduced a bill that would make available $25 million of government offshore revenues for marine exploration and mapping: 'We should reinvest at lease part of the revenues ... in programs that will expand the resources that provide the revenues'. Sen. Russell Long has proposed an even more ambitious plan. "He would earmark 52-1/2% of federal revenues from offshore oil and gas leases for marine science research". (Revenues currently total more than $1 billion annually). Long "is convinced that a

wide range of benefits would result" from such a reinvestment; he cites the need for improved control of pollution of the ocean, of expanding the nation's fishing industry, and the development of mineral resources.

81. "Fighting the Budget Bite", Science News, v. 94, no. 1, July 1968, pp. 6-8.

The New York Academy of Sciences met in emergency session on June 21 to consider the financial "crisis facing American science" and what to do about it. The article describes some of the events leading up to the meeting, presents the views of various scientists in attendance, and discusses the meeting's probable impact. "The main concern [of the meeting] was that drastic cuts in Federal science spending will cause permanent damage to research groups ... to universities attempting to train scientists, and to the image among young people of science as a career -- the latter two already in trouble". Of special concern was the pending 20 percent cut in the National Science Foundation's budget for 1969, as well as other recent R&D budget cuts in other agencies that support science. "Whatever the warnings and impassioned pleas, however, it seems that they come too late to save the funds this year". Little encouragement was offered by government representatives in attendance: Congressional indifference 'reflects a growing feeling that basic research isn't as important as scientists believe'; and should 'the Vietnam war end tomorrow, there would be more than enough claimants to spend that money five times over'.

82. "Research Funds: LBJ, Scientists Confer", Chemical & Engineering News, v. 46, no. 33, 5 August 1968, p. 22.

Representatives of the New York Academy of Sciences have proposed that President Johnson "convene a White House conference of 'elder statesmen of science' to set priorities for federal R&D support". The proposal -- apparently a product of the Academy's emergency meeting in June -- was presented directly to the President in an "off-the-record session" on July 30. In its prepared presentation, the Academy pointed out that since 1964 the annual increase in federal funding has been barely enough to keep up with rising research costs. A 'growing skepticism among legislators about the value of federal R&D spending' was noted, which was partly blamed on scientists for 'failing to explain adequately the long-term advantages of such spending'; congress 'has also made clear its belief that, for the present at least, other needs have priority over scientific spending'. Recognizing these conditions, the Academy proposed that the "elder statesmen of science" assign priorities

to ensure that the federal R&D funds that were available be "directed to the areas of greatest importance to science and the nation".

83. "Science Funding: Looking Beyond the War", Science News, v. 94, no. 3, 20 July 1968, pp. 57-58.

This brief article presents some of the differing viewpoints on the prospects for government support of basic science after peace in Vietnam. The view of Donald Hornig, the Presidential Science Adviser, is that the need for basic research 'is accepted by the executive, by the Congress, and by the people of the country'; in his view, "the current tightening of the budget ... for ... science is temporary, caused by the ... Government's Vietnam budgets". The opposite view is held by Thomas Gold of Cornell University: 'There are many Congressmen who regard scientific research as a leak in the budget barrel, ... and having plugged it, are not likely to drill new holes". Former Budget Bureau director, Charles Schultze, believes that the money released by the war's end "will probably disappear in a tax cut". Frederick Seitz, president of the National Academy of Sciences fears that basic science may come to be supported 'only through the National Science Foundation at some more-or-less fixed budget ...'. Many observers believe that support of basic science, especially in the form of institutional grants, as a "part of a general commitment to higher education is both a most fitting way of obtaining the support and most agreeable to Congress and the public".

IV NATIONAL R&D PROGRAMS

70. "Federal Oceanic Funding", Industrial Research, v. 10, no. 6, June 1968, p. 36.

> "The U.S. government is not likely to mount any huge program in support of oceanographic technology in the foreseeable future", according to Simon Ramo. "Those interested in furthering the admittedly promising future of ocean resource development, he suggests, should use this as the basis of a new approach to ways of financing needed R&D in the field". Among the proposed approaches were government incentives for industry to conduct oceanographic research and for joint government-industry support of university centers to conduct technological studies as well as "research into the economic and social considerations that can make the field grow and prosper". Specific proposals included: "new joint venture laws"; "a monopoly for a limited time"; "exceptional tax writeoffs"; and "special loans".

71. Klima, O., Jr., and Wolfe, G.M., "The Oceans: Organizing for Action", Harvard Business Review, v. 46, no. 3, May-June 1968, pp. 98-112.

> This article discusses the need for the government to formulate a national program for oceanography and warns that unless it does so ... and quickly ... the U.S. may awaken to discover a hydrospace gap by 1972. A single federal agency with "at least 'overview' and program planning responsibility for all of this nation's interests in the ocean" is urged. A possible interim role is outlined for the National Council on Marine Resources and Engineering Development, enroute to a proposed new agency; the latter should be something like the former National Advisory Committee of Aeronautics, rather than a NASA-type organization. The key roles for industry -- which cannot be exercised until the government defines the national program -- are described. The authors present their own "roadmap" of "U.S. ocean objectives and programs" and illustrate the type of planning that should go into a national program.

72. "Air Transport Report", Science, v. 161, no. 3842, 16 August 1968, p. 670.

A major role in civil aeronautics R&D has been recommended for the National Aeronautics and Space Administration (NASA) by the Aeronautics and Space Engineering Board of the National Academy of Engineering. The board's report, which was financed by NASA, also recommended that a "comprehensive study of the whole air transportation system be made and priorities set for research and development". The report, in addition, calls for the Department of Transportation and the Federal Aviation Administration to provide "leadership in carrying out comprehensive studies" in air transportation. (The report, Civil Aviation Research and Development: An Assessment of Federal Government Involvement, is available at $4 from the Aeronautics and Space Engineering Board, National Academy of Engineering, 2101 Constitution Avenue, Washington, D.C.).

73. "Planetary Exploration, 1968-1975", Report of a Study by the Space Science Board, National Academy of Sciences - National Research Council, (June 1968), Washington, D.C., July 1968, 49 pp.

This report recommends space exploration goals, level of support, priorities, and specific programs for the 1968-1975 period. In reappraising its 1965 study recommendations, the Board calls for the use of automated rather than manned spacecraft in future planetary exploration: "We were unable to identify a need in planetary exploration, in the foreseeable future, for the unique abilities of man". The Board also recommends that "a substantially increased fraction of the total NASA budget be devoted to planetary exploration". Among the high priority missions recommended are: small "spacecraft to orbit Venus and Mars at every opportunity" ... and "exploratory missions to other targets"; two Mariner-type missions to Mars; "a Mariner-class Venus-Mercury fly-by"; a "drop-sonde mission to Venus"; and "a major lander on Mars, perhaps in 1975". Scientific experiments and programs are suggested in the planetary areas of atmospheres; surfaces; dynamics and interiors; particles, fields, and interactions with the solar wind; and exobiology.

74. "For the '70s, Ocean Exploration on an International Scale", Space/Aeronautics, v. 49, no. 6, June 1968, pp. 28-30.

The proposed International Decade of Ocean Exploration (IDOE) is discussed in terms of funding, areas of concentration and program management. The total IDOE may cost as much as $100-150 billion, with the U.S. expected to contribute some 30-40 percent, which would come to

$3-5 billion annually. The Soviet Union is expected to provide a third of the support, while the other 40 participating nations would contribute the remainder. The IDOE programs will probably focus "on the same general areas as current federal programs in marine science and technology, excepting for the almost 30-percent concentration in projects affecting national security"; as with the domestic program, "the major efforts will be directed toward shelf waters", because of the "immediate promise of economic payoff". At a national level, a permanent coordinating organization for the U.S. effort will be necessary, if "the nation is to participate meaningfully in the IDOE"; the same need also exists at the international level.

75. "NAS Asks Boom Research", Industrial Research, v. 10, no. 8, August 1968, pp. 23-24.

In its third study of the supersonic transport (SST), the National Academy of Sciences calls for more research to determine the human reactions to sonic boom. The report, prepared by the Academy's Human Response Subcommittee, states that 'a review of field studies of psychological impact of the sonic boom shows a growing consensus that is discouraging for the use of the current version of the ... (SST) over populated areas'. The subcommittee, however, expresses 'cautious optimism' that it may be possible to design a SST that will generate a boom of 'acceptable characteristics'. Research in the following areas, according to the subcommittee, is urgently needed: laboratory boom studies of human reactions; facilities for simulating booms; studies of human response to the boom during sleep; and continued studies of over flights at different boom levels. (Previous NAS studies in the area have dealt with means for reducing the boom intensity and boom damage to buildings and structures).

76. "Senate Unit Concurs on NASA Budget Cut", Aviation Week & Space Technology, v. 89, no. 3, 15 July 1968, p. 24.

The Senate Appropriations Committee agreed on a $362-million reduction in the National Aeronautics and Space Administration's (NASA) spending during FY 1969. "Further cuts may be forthcoming in NASA's budget after final Senate action on the committee recommendation"; beyond that, NASA may have to absorb some of the promised $6 billion reduction in overall federal spending. Both the Senate and the House agreed that "only the most important and highest-priority programs be funded at this time"; this includes the Apollo program and work on a nuclear rocket

engine. "The committee reduced over-all research and development allowed by the House by $13 million, to $3.4 billion. It increased the construction of facilities appropriation by the same amount".

77. Normyle, W.J., "NASA Trims Efforts to Meet Budget Cuts", Aviation Week & Space Technology, v. 89, no. 5, 29 July 1968, pp. 21-22.

"National Aeronautics and Space Administration is preparing to conform to an operating budget of about $3.8 billion for Fiscal 1969. That would be the lowest amount authorized for NASA since Fiscal 1963". The key areas directly affected by the reduced budget are the Apollo Applications Program of the Office of Manned Space Flight and the Mariner/Mars flights of the Office of Space Science and Applications. "Each would be sharply redefined under the newly proposed budget level, although Apollo Applications would be practically obliterated from the original plan". NASA Administrator James Webb, in an interim guideline distributed privately to key agency officials, warned that the impending congressional cuts in NASA's budget "would certainly be followed by further cuts by President Johnson". To prepare for this, NASA is working out plans "under which they could adjust to a variety of budget levels ranging from a low of about $3.3 billion to whatever the Congress finally appropriates".

78. Emme, E.M., "Historical Perspectives on Apollo", Journal of Space and Rockets, v. 5, no. 4, April 1968, pp. 369-382.

"This historical essay focuses upon the major elements culminating in mid-1961 with a national decision to broaden and to accelerate the American space program". The author, who is responsible for the preservation and preparation of NASA's official history, reviews the "earlier events and national decisions influencing aerospace technology and ... the evolution of the concept ... for a lunar landing mission". This "strategic decision" to accelerate the space program "has emerged as the largest single technology enterprise of a nonmilitary nature ever undertaken". "Confidence that science and technology can be mobilized for virtually any national problem on earth amenable to technical solution has been greatly enhanced by our space program". The author concludes that "all of the relevant factors that existed in 1961 -- including the strategic requirements of national security and world peace, of technological progress serving national welfare, and of the known unknowns of possible cosmographical discoveries with fundamental new knowledge -- are still present".

V SCIENCE, EDUCATION, AND THE UNIVERSITY

56. "Science and the Human Condition", A Centenial Year Symposium, The Center for Advanced Study, Graduate College, University of Illinois, Urbana, Illinois, 1968, 30 pp.

This is the final report of the cited symposium (November 29 - December 2, 1967) which dealt with the question of how higher education should be modified to take into account the impact of science and technology on society. The report contains the statements prepared by seven working groups on: how teaching should be modified in particular disciplines (Philosophy, Social Sciences, Literature, and History) to reflect the significance of science and technology; what courses universities should offer in science and public policy; and means for improving the communication of "information about science to the general public". The formal addresses (which included presentations by I.I. Rabi, Polykarp Kusch, and Jacob Bronowski) are not included, but most will be published in The Bulletin of the Atomic Scientists. (Correspondence in connection with this material should be directed to Dr. Joel Snow, Center for Advanced Study, 912 West Illinois, University of Illinois, Urbana, Illinois).

57. "Science-Public Policy Programs Mushroom", Chemical & Engineering News, v. 46, no. 29, 8 July 1968, pp. 30-32.

Over 40 U.S. academy institutions are reported to offer masters and doctorate degree programs in science and public policy. This article discusses the factors behind the explosive growth of programs in this area and briefly describes the approach and emphasis of a few of them. Interest in such programs, according to the article, is due to the conviction that universities, "better than any other institutions ... can use their inner mix of brainpower to penetrate the galaxy of issues Government simply can't seem to get at".

58. "Pre-Doctoral and Post-Doctoral Student Support", in Grants Administration, Department of Health, Education, and Welfare, U.S. Government Printing Office, Washington, D. C., 1968, 7 pp.

This policy statement, which became effective on 1 July, standardizes traineeship and fellowship grants of the Department of Health, Education, and Welfare. For pre-doctoral students, stipends start at $2,400 for the first year of graduate work and rise to $2,800 for the last pre-doctoral year; post-doctoral stipends are $6,000 for the first year, $6,500 for the second, and $7,000 for all additional

years. The policy also sets a standard dependency allowance of $500 per year, and $1,000 per year as the maximum additional funds that can be received from other governmental agencies.

59. Kash, D.E., "Research and Development at the University", Science, v. 160, no. 3834, 21 June 1968, pp. 1313-1318.

This paper notes the "growing call from government for the universities to do applied research in the civilian sector" and discusses the possible approaches and impediments to an effective response by the universities. From an analysis of recent congressional actions and debate, the author concludes that "government needs public policy help" ... "universities have the creative talent to give it" ... "systems analysis provides the method" ... but "universities are inadequately organized to offer the help". The characteristics and goals of the national science policy being sought by Congress, and the consequent kinds of service demanded from universities, are discussed in relationship to the "purposes of the university". Of the several possible responses that could be made to this new demand, the author recommends an "interuniversity" response organized around some version (four are discussed) of a consortium.

60. "Wesco Report on Higher Education Expected by Fall", Scientific Research, v. 3, no. 14, 8 July 1968, p. 21.

The Wescoe report on federal support of higher education is expected to be released by next fall. The report will become part of a new 'strategy for higher education', called for by the President in his education message earlier this year. An interagency group is now at work on the strategy, which "will set national policy on such key research questions as project vs. institutional grants, and time-and-effort reporting". Among those on the interagency committee are: Directors Leland Haworth of the National Science Foundation and James Shannon of the National Institutes of Health; Deputy Director Ivan Bennett of the Office of Science and Technology; Assistant Secretary Philip R. Lee of HEW; and William Carey, top science officer of the Bureau of the Budget.

61. "College Grant Bill Gets Mixed Reception", Chemical & Engineering News, v. 46, no. 29, 8 July 1968, pp. 24-25.

A House bill (H.R. 875) to award institutional grants to colleges and universities for improving their science education and research capabilities met mixed reception in recent congressional hearings. The bill,

which would authorize $150 million a year in "unfettered grants", drew general support for its intent and objective, but was sharply criticized for the proposed formula under which the grants would be made. The formula is intended to help smaller schools, prevent the bulk of the funds from going to larger schools, and to channel funds to geographical areas "where they are most needed". However, the formula could allow the large and better developed graduate schools to receive more funds than the smaller ones; in addition, schools could "gear their programs to take maximum advantage of the ... formula" at the expense of "quality education".

62. Jamison, A., "Senate Aims Blow at Colleges That Bar Recruiters", Science, v. 160, no. 3834, 21 June 1968, p. 1320.

The Senate has added an amendment to the National Aeronautics and Space Administration (NASA) authorization bill "which would deny NASA grants to institutions that bar Armed Forces recruiters from their campuses. "Although on the surface the amendment is aimed at simply forcing the colleges that ban recruiters to stop doing so, its actual results and effects might be different and farreaching". Some of the expected side effects include: (1) difficulty in renewing NASA grants to those "institutions that now bar recruiters"; (2) "an even larger part of NASA's academic program ... could be affected if the war in Vietnam continues and more universities bar military recruiters from campus"; (3) "the amendment punishes people [NASA and university scientists] who really have nothing to do with the various institutions' decisions to bar recruiters". "Whether the amendment will make it through the House-Senate conference on the NASA authorization is uncertain".

63. Carter, L.J., "Sea-Grants: Demand Is High, But Budget Is Low", Science, v. 160, no. 3834, 21 June 1968, p. 1323.

This article reviews the "sea grant" college program which has been underway now for a year, describes some of the programs it is supporting, and discusses its funding problems. To the present, the National Science Foundation (NSF) has made grants totaling $5 million to some 30 colleges and universities; these include institutional grants to six universities. For FY 1969, NSF asked for a program budget of $15 million, but the Bureau of the Budget imposed a $6-million ceiling. NSF has warned that "unless $30 million of a $100-million House cut in NSF's appropriation is restored, the sea-grant budget will be reduced to $5 million"; as a result, "institutional programs and renewable projects may be supported at levels lower than grantees had been led to expect". Although

"the sea-grant program shows promise of eventually having a major impact, its immediate prospect is for little or no growth, and possibly for retrenchment".

64. Mueller, M., "University Heads Seek More U.S. Aid", Science, v. 161, no. 3836, 5 July 1968, p. 28.

Some 40 of the nation's major universities issued a statement on 25 June calling for greater federal assistance to higher education. The statement warned that "despite the high federal costs of defense, the Vietnam war, and urban problems, the federal government cannot ignore the 'worsening fiscal crises' in colleges and universities until after these other issues are resolved". Graduate education, the statement said, poses special problems: "graduate enrollments may more than double by the end of the century and the cost of educating a graduate student is three to six times that of educating an undergraduate". In addition, new areas of study, especially in the sciences, will require large expenditures: these include such fields as molecular biology, oceanography, and "the introduction of quantitative methods programs into the social sciences". (The statement was prepared by a committee of the Association of American Universities, headed by Robert F. Goheen, President of Princeton University).

65. Skolnikoff, E., "Science and Public Policy Meeting at AAAS", Bulletin of the Atomic Scientists, v. 24, no. 6, June 1968, p. 49.

This is a brief account of the special series of symposia on "science and public policy" that were held at the December 1967 annual meetings of the American Association for the Advancement of Science (AAAS). "The primary purpose of the series was to bring together, for the first time, American university faculty engaged in academic programs in the field of science and public policy". Some 40 U.S. universities were identified as having "made a commitment in one form or other to developing teaching and/or research programs" in the field. The overall program consisted of two symposia, a dinner meeting, and a workshop session. One symposium dealt with "Science and Technology as Instruments of Policy" and the other with "Science, Technology, and Political Decision-making"; the workshop "focused on developments in the university study of science and government relationships". A second workshop is tentatively scheduled for the December 1968 AAAS meeting.

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

90. Boffey, P.M., "Effort Reporting: Government Drops Much-Criticized Paperwork", Science, v. 160, no. 3834, 21 June 1968, pp. 1322-1323.

The "time-or-effort" reports, required by university researchers working on government-sponsored research, have been eliminated by the Bureau of the Budget. The reporting procedure, set up a decade ago, was generally regarded as fictional, useless, and burdensome. Under the new procedures, effective in June 1968, "the amount of government support for faculty members will be agreed upon in advance by the granting agency and the educational institution"; the "support of nonfaculty researchers will be based on data from institutional payroll systems". The actual implementation of the new procedures is left to the individual granting agencies.

91. Podnos, S.S., "Research and Development -- and the Congress", The GAO Review, Spring 1968, pp. 40-46.

The author, an assistant director in the R&D group of the Defense Division of the General Accounting Office (GAO), reviews the involvement of Congress in research and development policy from 1790 to the present. He concludes that, "The Congress is now taking a more searching, complete, and continuous look at Federal research and development toward better exerting its oversight responsibilities ... The portent of the future is for even greater attention on the part of the Congress to Federal research and development". Increasing GAO attention to research and development activities is also noted. This trend "is resulting in the incremental acceptance by our scientific colleagues of oversight and the usual management controls as a necessary element of responsible and effective governmental operations".

92. "Daddario Urges Change in Environmental Services", Science, v. 160, no. 3822, 7 June 1968, p. 1095.

Representative Daddario in a June 4 speech "recommended that the Interior Department be ... the "lead agency" to coordinate the environmental activities of the government. He "urged that the National Center for Air Pollution Control and the Solid Waste Division be transferred" from HEW to Interior, with HEW remaining responsible for provision of health data. Citing his

subcommittee's conclusion that 'the Federal Government is not organized for environmental management' and that recent federal reorganizations 'have worsened the environmental control situation', Daddario said he would recommend his change to the appropriate congressional committees.

93. Topol, A.J., "Law and the Nation", Saturday Review, v. 51, no. 31, 3 August 1968, pp. 49-52.

This article is a rebuttal to W.J. Ferry's view (see Science Policy Bulletin, Vol. 1, No. 4, p. 39, item 73) that "science and technology provide a panacea for all ills". Ferry contended that "increased government control over technological development is needed and that "the present Constitution of the United States does not permit the necessary legislative and administrative action". The author questions the conclusion that Congress cannot adequately function under the present Constitution. "The 'commerce clause' ... of the U.S. Constitution ... has been the basic source of congressional authority for controlling technological development for the last 175 years". The remainder of the article is devoted to historical and contemporary examples of federal action, under the commerce clause, aimed at controlling technology.

94. "Academies Assessing Future of Technology for Rep. Daddario", Scientific Research, v. 3, no. 14, 8 July 1968, p. 21.

"The public policy committees of the National Academy of Science and the National Academy of Engineering are working on separate reports assessing technology". The reports, which are being prepared for Rep. Emilio Daddario's House Subcommittee on Science, Research and Development, will be used by Daddario as the basis of legislative hearings next year aimed at developing a national policy on the use and abuse of technology. "Despite the tight budget situation, Daddario succeeded in getting $50,000 from Congress for the studies".

95. "National Science Foundation Scope Broadened", Washington Science Trends, v. 20, no. 16, 29 July 1968, p. 91.

Provisions of the new legislation broadening the authority and scope of the National Science Foundation (NSF) are described. NSF is now specifically directed "to support the social sciences on a co-equal basis with other sciences"; the Foundation is also authorized to support applied research 'when directed by the President in connection with national problems involving the public interest'. Other

sections of the new charter direct NSF to "foster and support the development and use of computers and other scientific methods and technologies, primarily for research and education in the sciences". In spite of the added responsibilities, NSF's funding authorization for FY 1969 is expected to be 20 percent less than requested.

96. "Science Foundation: Expanding to the Practical", Science News, v. 94, no. 2, 13 July 1968, pp. 33-34.

The reorganization of the National Science Foundation (NSF) is aimed at increasing the social relevance of its supported research, making it more responsive to Congress, and replacing its passivity with a more active role in program formulation and policy making. Under its new charter, NSF is authorized to support applied research and directed to support the social sciences; this is expected to increase the social relevance of its research. In addition, annual authorizations and associated congressional hearings on the requested budget will allow the Congress to express its feelings on what programs should be supported, and with what priorities. NSF will also be required to analyze and interpret data on national scientific and technical resources, rather than simply collect and collate such data as it has done in the past. The reorganization also elevates NSF's director from a level III to a level II position, which places him on a par with the heads of most independent agencies, and authorizes four assistant directors. This move aims to increase the program-formulation and policy-making activities of NSF.

97. "HEW Reorganization", Industrial Research, v. 10, no. 8, August 1968, pp. 24-26.

The recent reorganization of the Department of Health, Education and Welfare (HEW) is described, and some congressional criticism of its effectiveness is cited. The major reorganization, effective July 1, created a new agency -- the Consumer Protection and Environment Health Service -- and rearranged other HEW agencies and activities. Absorbed by this new agency are the Food and Drug Administration, National Center for Air Pollution Control, radiological health, and urban and industrial health. In a related move, HEW secretary Wilbur Cohen will be authorized to establish a council for "coordinating the health activities of all the federal agencies involved in national health programs". Criticism of the reorganization has come from Rep. Emilio Daddario, who objects to the grouping of air-pollution control with consumer-protection services. He believes this will lead to long-term efforts to determine "cause-and-effect relationships between pollution and human

health" that will delay, unnecessarily, pollution abatement: 'We need not wait for precise health hazard definition in order to reduce air pollution'.

98. Small, W.E., "For NIH: New Problems, New Horizons", Scientific Research, v. 3, no. 15, 22 July 1968, pp. 21-23.

Problems and prospects for the National Institutes of Health (NIH) are discussed with respect to funding, areas of R&D, and organization. For fiscal year 1969, "the agency was treated better than most by Congress on its budget request"; but, with its possible contribution to the promised reduction of overall federal spending by $6 billion, NIH may receive an "overall cut of as much as 15 percent -- which would reduce the ... budget to less than $1 billion". Coinciding with the budgetary restrictions is the loss of the three persons credited with the growth of NIH over the last decade: Rep. John Fogarty, Sen. Lister Hill, and James Shannon, director of NIH; their replacements, and their possible influence on the future of NIH, are discussed. Research areas needing increased support, according to Philip R. Lee of the parent Department of Health, Education & Welfare (HEW), include: human reproduction and fertility control; trauma; pharmacology and toxicology; aging; child development; mental retardation; and biomedical engineering. The recent reorganization of HEW is discussed with respect to its effects on NIH which acquired two new agencies and the responsibility for coordinating and balancing the support of education and training in the health area.

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

90. "Foreign Research Dollar Drain", Report of the Committee on Government Operations (Based on a Study by the Research and Technical Programs Subcommittee), U.S. House of Representatives, Ninetieth Congress, Second Session, House Report No. 1578 (24 June 1968), U.S. Government Printing Office, Washington, D.C., 1968, 14 pp.

This report is sharply critical of federal agencies for financing approximately $20 million of research annually in foreign countries, especially in view of the current U.S. balance-of-payments deficit. The report presents data on the distribution of dollar obligations for research by country and by funding agency for fiscal year 1967; the bulk of the expenditures goes to the "developed countries ... which the committee believed could well afford to support their own research". The committee suggests that the federal agencies involved (primarily the Department of Defense, the Department of Health, Education and Welfare, and the Atomic Energy Commission) "limit dollar financing of new foreign research projects to those which are urgently needed by the United States, cannot be carried on in the United States by either American or foreign scientists, and will not be financed by foreign countries despite specific efforts by the United States to obtain such alternative financing".

91. Nelson, R.R., "Big Technology, the Technology Gap, and a Dangerous Policy Pitfall", Presented at The Sixth Goddard Memorial Symposium held in Washington, D.C., (4-5 March 1968), The Rand Corporation, Santa Monica, California, AD 666 418, March 1968, 18 pp.

Europeans have attributed the "technology gap" to massive support of "big science and technology" by the U.S. government and "have proposed that the remedy is for European governments to do likewise". The author argues that this misreading of the gap's basis might lead Europe into "squandering ... considerable resources that could be used better in other ways", and the U.S. into a "meaningless, but extremely expensive, technological race for its own sake". Although the gap is regarded by the author as "real in a wide variety of fields, aside from defense and space it probably has far less to do with U.S. big science than many people think". The paper also discusses the meaning and existence of a technology gap (which is viewed as a long-standing phenomena), and the potential dangers that a "big science policy" -- pursued either by the U.S. or by Europe -- could hold.

92. Gilpin, R., "European Disunion and the Technology Gap", The Public Interest, no. 10, Winter 1968, pp. 43-54.

For many Europeans, the "technological gap is real, is threatening ... and is widening"; for Washington, the gap is "an official nonissue". For the author, the gap is real and has its basis in the disunion among the European countries: the lack of a "common institutional framework in the governmental, economic, and academic spheres"; the failure to concentrate resources, to develop a division of labor, and to eliminate duplication; and the lack of common economic, military, and political goals and policies. The removal of these obstacles -- which the Common Market was expected to do, but hasn't -- is necessary for an effective European science policy. The author concludes that unless common policies toward science and technology can be developed, "Europe will become even more irrelevant as an independent power in a world whose affairs are dominated by scientific societies of continental dimensions".

93. Borgese, E.M., "A Center Report/The Republic of the Deep Seas", The Center Magazine, v. 1, no. 4, May 1968, pp. 18-27.

This report, from the Center for the Study of Democratic Institutions, describes the "Maltese Proposition" to create an international "regime" for exploring and exploiting the oceans and discusses its problems and prospects. The proposition -- initially favored by the U.S. and the U.S.S.R., but now regarded as "premature" by both -- faces the problems of establishing the limits of national jurisdiction, defining "peaceful purposes", and creating an international trusteeship, as well as others. A tactical approach to avoid "fruitless debate" over such issues is presented, and the elements of a model treaty based on the proposition is given. The author concludes that the time is not ripe for the actual treaty, but that its model can be used for progress in that direction.

94. "Vice President Humphrey Reports on Response to Proposal for International Decade of Ocean Exploration", Press Release, National Council on Marine Resources and Engineering Development, Washington, D.C., 18 June 1968, 5 pp.

Several foreign nations have responded favorably to the President's proposal of March 8 for an International Decade of Ocean Exploration. Vice President Humphrey, who is chairman of the above Council, reports that several international organizations and foreign governments (U.S.S.R., U.K., W. Germany, and Norway) have endorsed the concept. "All agreed on the need to strengthen international planning and coordinating mechanisms, and ... to broaden the base of the Intergovernmental Oceano-

graphic Commission which can serve as a focal point for oceanic research". Various groups of the United Nations are also to take up the proposal; meanwhile, the Marine Sciences Council has asked the National Academies of Sciences and Engineering "to prepare preliminary recommendations concerning the scientific aspects of the US contribution to the Decade, with particular emphasis on scientific objectives and priorities and the relationship of scientific achievements to national goals".

95. "Defense Department Sponsored Foreign Affairs Research", Hearing before the Committee on Foreign Relations, U.S. Senate, Ninetieth Congress, Second Session, Part 2 (28 May 1968), U.S. Government Printing Office, Washington, D. C., 1968, 69 pp.

These hearings, which present the testimony of Adm. Hyman Rickover, cover a diversity of topics, including the management practices of DOD, "think tanks", social science, and the military-industrial complex, as well as DOD's foreign-area social-science research. Rickover is critical of social science in general, and DOD-supported social science in particular. He believes that such research should not be sponsored by the military, nor in fact, by the government at all; that it has little if any relevance to DOD's mission; and that much of it "has been a waste of taxpayer's money". In addition to the military-industrial complex, he also sees both an industrial-political and a military-scientific complex. It is the latter complex -- which Rickover identifies as "the close inner circle composed of researchers within [DOD] and those working for [DOD] under contract" -- that "is the really dangerous one". As a first step towards controlling this complex, Rickover proposes a "Who's Who" listing of think tank and university people working for DOD and NASA, including salaries of the "top 25 percent of the peoples listed", and a history of their relations with government.

96. "Sweden and DOD Research", Science, v. 160, no. 3834, 21 June 1968, p. 1321.

After months of protests, the Swedish Riksdag (Parliament) "has decided not to change the policy of noninterference by the Swedish government in relation" to research sponsored by the Defense Department (DOD). Earlier, some Riksdag members proposed that the Swedish government "oversee DOD projects, which total about $300,000 ... and are, predominantly, for basic research". The proposal arose from protests against the war in Vietnam and charges that the DOD-support research "was contributing to the war effort". Under the old policy, which continues in force, individual scientists can engage in such research without interference from the government.

97. "'Brain Drain' Loophole", Industrial Research, v. 10, no. 7, July 1968, p. 34.

A possible loophole in U.S. immigration regulations may allow the brain drain to continue in spite of recent legal efforts to contain it. Under present rules, foreign engineers and scientists can "accept posts in the U.S. -- if sponsoring firms can satisfy the authorities that the individuals concerned are essential for particular work". The extent to which this loophole will be used depends upon the interpretation of the regulation by immigration authorities: a strict interpretation, for example, "could cut the United Kingdom's 'contribution' of scientists to a 3,000 per year trickle"; under a loose interpretation, however, "scientific emigration to the United States in 1969" from the U.K. could be as high as 24,000. How the regulation is to be interpreted "is of considerable moment to a wide range of U.S. firms that badly need British scientists and technicians to offset a growing technical manpower shortage".

98. Boffey, P.M., "AAAS Names Environmental Group", Science, v. 161, no. 3836, 5 July 1968, p. 29.

The American Association for the Advancement of Science (AAAS) has named nine new members to its Committee on Environmental Alteration. The new committee, headed by Jack P. Ruina of M.I.T., is to study various environmental problems. The committee's origins go back some two and a half years to the 1966 AAAS annual meeting, when a resolution was passed calling for the AAAS "to investigate the military use of chemical and biological agents in Vietnam"; opposition to the resolution led to a broadening of the Committee's scope to study the "uses of such agents to modify the environment, whether peaceful or military". But the committee's first assignment was to review a study of the military use of herbicides in Vietnam, which promptly led to the resignation of some of the original appointees. The AAAS subsequently decided to review the study itself. The new committee, "divested of its responsibility for reviewing Vietnam defoliation, will set its own tasks at an initial meeting".

99. "The U.S. and International Science in Europe", International Science Notes, no. 20, August 1968, pp. 6-10.

This article describes some of the science-related organizations of Europe with which the U.S. could, or already does, cooperate, and discusses means and prospects for further cooperation. Among the international organizations described are: OECD, the European Communities (EURATOM, ECSC, and EEC), NATO Science Program, European

Space Research Organization (ESRO), European Launcher Development Organization (ELDO), and the European Nuclear Agency (ENEA). The purpose of each organization is described, and the obstacles and opportunities for U.S. cooperation are cited. The article also discusses the "technology gap" ("a devisive element in our relations with Europe"); the exchange of scientific and technical information ("European countries could be more cooperative"); and commercial standards for products ("US has much to contribute and to gain by exercising strong leadership"). It is concluded that science and technology "have become major areas for the practice of foreign affairs and major tools in the pursuit of foreign policy objectives".

100. Knoppers, A.T., "The 'Technostructure' Gap", Interplay, v. 1, April 1968, pp. 26-28, 34.

This article contends that the U.S.-Europe technology gap is "readily demonstrable", is "growing wider all the time", and is due to a "technostructure gap". Factors identified as aggravating the situation are: the shrinking time lag between inventions and the introduction of "marketable technology"; the "self-nourishing capacity" of advanced technology" (it attracts the funds and the brains needed for its own improvement); the dissemination of new technologies "within large international corporations, most of which are based in the [U.S.]"; and the "American dominance of the computer industry". The author, who is a senior vice president of Merck & Co., Inc., discusses and illustrates the importance of management in generating marketable technology and cites corporate size, the availability of risk capital, "lavish government expenditures on R&D", the mobility of researchers, and mass education as factors favoring the U.S. "Europe's progress in the direction of technological parity will require massive good will on both sides of the ocean and considerable emulation of America".

101. Thiesenhusen, W.C., "Building New Nations: Compensation for the Brain Drain", Current, no. 96, June 1968, pp. 48-52.

This article reviews the scope and cost of the brain drain, especially in the medical areas, and suggests that the U.S. "compensate developing countries for the human capital they send us". The author considers three possible strategies for coping with the drain: (1) erect legal barriers against the movement of skilled persons from less-developed countries; (2) modify the training foreign students get in the U.S. so that they will be encouraged to return to their home country; (3) "provide indemnities for 'imported' manpower resources". The first two strategies are rejected in favor of the latter, which could take the form of "using some mea-

sure of the brain drain as an allocation criterion in deciding how our foreign aid should be apportioned among countries". Various other forms of compensation are also considered. The author discusses and presents some quantitative estimates of the importance of skilled human resources in economic development and reviews estimates of the brain drain's cost to the developing nations.

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

161. "Science in India -- Some Aspects and Applications", Science and Culture, v. 34, no. 1, January 1968, pp. 1-15.

This article presents the full text of an address by Dr. Atma Ram, General President of the Varanasi Session of the Indian Science Congress, and an editorial commentary upon the talk. The talk is broadly addressed to the many problems of India and to the relation of science and technology to their solution. A background and overview of Indian science and technology is given, and many suggestions are made for improving the contribution of science and technology to India's economic growth.

162. Walsh, J., "Max Planck Society: Filling a Gap in German Research", Science, v. 160, no. 3833, 14 June 1968, pp. 1209-1210.

This article describes the role and activities of the Max Planck Society in German research and notes some of its problems. The society's purpose is to compensate "for the shortcomings in research of a university whose professors still operate in a sort of pre-Bismarkian confederation". The society finances more than 50 research institutes and "... cultivates new and developing areas of research which might be excluded in the rigid university system". The various organizational patterns of the institutes are cited and discussed; the latest development is the movement toward 'centers' for research, "combining several institutes and making possible a broader interdisciplinary effort". The society's budget is about $62 million a year. "Perhaps 5 percent of the budget is in nongovernment funds. The balance is provided, roughly half and half, by federal and Länder governments. The government funds are not earmarked for specific purposes or institutes and are spent as the society decides they should be".

163. "Co-operation Between the Royal Society and the Czech Academy of Sciences", SSF Newsletter, Science of Science Foundation, London, v. 3, no. 4, June 1968, p. 3.

An agreement on scientific co-operation has been established between the Royal Society and the Czech Academy of Sciences. "It calls for both sides to facilitate contacts between specialists in the

scientific disciplines within their mutual competence, and makes specific provision for visits of two weeks duration by two senior scientists annually from each side". The objectives of the visit are for "acquainting themselves with developments in their particular sphere in the host country, visiting scientific institutions, lecturing and holding seminars as may be appropriate, and generally informing their hosts of developments in their own countries". Provision is also "made for the annual exchange of up to three scientific research workers from each side to work in the other country ... on fundamental problems in some aspects of the physical sciences ... and biological sciences, including their applied aspects".

164. "Government Policy for Research Associations", SSF Newsletter, Science of Science Foundation, London, v. 3, no. 4, June 1968, pp. 3-4.

Policy changes for U.K.'s Research Associations (RAs) are described by the Ministry of Technology. (The Ministry makes grants to RAs to support cooperative research with industry). Among the changes are: the encouragement of "confidential sponsored work" and group-sponsored projects, with "limited circulation of reports to the sponsors". Emphasis on long-term research has been abandoned; the association is urged "to take part in various quasi-research matters, such as inter-firm comparisons, operational research, management and production problems, and ergonomics, and to cooperate in industrial and management training". In addition, more attention to "cost-benefit analysis in programme building" is encouraged, and the RAs are instructed to "interest themselves in the application of research results by their industries". The Ministry provides research grants to some 40 RAs; in 1967, the association employed some 1,660 graduates and had a total income of &13m.

165. Ritchie, R.S., "Has Canada Acquired a Science Policy? -- An Overview", Science Forum, v. 1, no. 3, June 1968, pp. 3-5.

Canada has not yet "acquired a national science policy", according to the former executive director of the Glassco Commission. R&D in agriculture and in atomic energy and nuclear research are discussed to illustrate the hard policy decisions involved in allocating research resources. The "Government of Canada has not in the past had the means, or perhaps the will" to make "its major research decisions" and to critically assess its annual departmental and agency budgets with respect to cost-benefit criteria. When a science policy is developed, and "if it is well grounded in the national

interest, we shall possibly spend a higher percentage of our GNP on ... R&D. Almost certainly ... we shall spend ... more government funds outside government research establishments. Even more certainly ... programs will be less a reflection of unrelated decisions or the predilections and momentums of particular research establishments".

166. Uffen, R.J., "DRB: Reorganization for Closer Ties with Canada's New Forces", Science Forum, v. 1, no. 3, June 1968, pp. 6-10.

The organization, policies, programs, and prospects of Canada's Defense Research Board (DRB) are described by its director. The DRB provides scientific advice, conducts in-house research, and supports applied and basic research for the minister of national defense, and the armed forces. Some 600 scientists and engineers comprise the DRB, which has an annual budget of about $50 million, 23 percent of which goes to extramural research. The major program areas are cited (e.g., weapons and armaments, telecommunications), and the proportion of the budget going to each is presented. In response to various factors (including rising costs and budgetary ceilings), a PPB-like technique, involving a "heuristic relevance tree", is being devised for allocating resources and setting priorities.

167. "New Senate Committee Creates a Public Platform for Policy Dialogue", Science Forum, v. 1, no. 3, June 1968, pp. 18-19.

The Canadian Senate has created a special committee for examining Canada's science policy. Acting as "an official public platform for dialogue", the committee is charged with examining: Canada's R&D expenditures as compared to those of other nations; federal R&D activities in the sciences; federal research aid to industry, universities, and individuals; and the "broad principles, long-term financial requirements, and the structural organization of a 'dynamic and efficient scientific policy for Canada'". The committee completed its first phase of hearings in the spring; two other phases, followed by a final report at the end of 1968 are planned.

168. "NRC Grants Nearly $4 Million to Establish Centres of Excellence", Science Forum, v. 1, no. 3, June 1968, p. 29.

Canada's National Research Council has awarded seven grants this year to help develop university centers of excellence in fields related to the scientific, economic, and resource development of the country. The grants will be used to establish a mathematical research center ($1,367,000), to

help the recently established Center for Research on Atoms and Molecules ($724,000), and for solid-mechanics research ($600,000). Smaller grants were awarded for support of environmental sciences, pest management, pure and applied mathematics, and human abilities research.

169. "Dispute Over Grant Control Freezes Japanese Funds for Basic Research", Scientific Research, v. 3, no. 12, 10 June 1968, p. 21.

A rift has developed between the Japanese government and its principal body of scientific advisors over the mechanism for disbursing a $14-million fund for research. Distribution of the fund, which is the main government source of money for basic research in Japan's universities, has been the sole responsibility of the Science Council for 20 years; under a new government proposal, the responsibility would be shifted to the Ministry of Education and a new system for screening research proposals for support would be initiated. Failure of the government and the council to resolve their differences is holding up disbursal of the already-approved funds; there "is no indication of an early resolution of the argument".

170. "Canadian Science Given Going-Over", Scientific Research, v. 3, no. 12, 10 June 1968, pp. 19,21.

"An 18-member special ad hoc parlimentary committee, drawn from the Canadian Senate, began an inquiry last March into the structure and aims of Canadian science". The committee resulted from complaints of Senator Lamontagne, now its chairman, that there was no forum for discussion of government science policy. The committee has so far heard witnesses from government advisory and policy-making agencies, as well as from foreign specialists in the field. "The feeling is growing in Canada that the government lacks an overall science policy and that the development of Canadian science is determined by default on the basis of the activities and expenditures of individual departments". "Observers say ... the committee [may] recommend ... a separate and permanent department of science to be headed by a cabinet minister".

171. Science Information in Japan, Second Edition, Prepared under the Grant GN-468 of the National Science Foundation, Japan Documentation Society, NIPDOK, Tokyo, Japan, 1967 192 pp.

This report, prepared with assistance from the U.S. National Science Foundation, describes Japan's policy for science and technical information as well as the associated organizations, mechanisms, and sources of information. The report, which updates the 1962 edition, also presents data on research ex-

penditures by performers, scientists by disciplines and type of organization, national research laboratories and experiment stations, and learned societies.

172. Blackett, P.M., "Science and Technology in an Unequal World", Science and Culture, v. 34, no. 1, January 1968, pp. 16-24.

This article, the first Nehru Memorial Lecture, is addressed to problems of economic development in India. The author believes that in India "almost everything must be sacrificed to economic growth". "Recent studies have shown that the fraction of the GNP which a nation spends on R and D is poorly correlated with the rate of growth of its GNP." By contrast, "there is close numerical relationship between investment and economic growth". Because of the shortage of investment capital in India, "the main hope of increasing the rate of growth of wealth is to increase the return on the capital investment". This requires very selective investment, the importation of technology to avoid waste of capital on re-invention, and a great increase in the number of qualified scientists and engineers. The latter must "move along the innovation chain toward the managerial and industrial end". For India "better managers and entrepreneurs are often more important than better technologists".

173. "Romanian Exchange", Science, v. 161, no. 3837, 12 July 1968, p. 144.

The President's science advisor, Donald F. Hornig, has announced a broadened scientific exchange program between the U.S. and Romania. Under the new agreement, each country will assign a science officer to its respective embassy. In addition, it allows for a wider exchange of information on commercial enterprises, "an increased exchange program for scientists and scholars and greater cooperation in peaceful uses of atomic energy". The agreement resulted from meetings between Hornig and the Deputy Prime Minister of Romania.

174. "Hungary Moves to Improve Science", Scientific Research, v. 3, no. 15, 22 July 1968, p. 17.

The Hungarian government has launched a study of research and research planning "to develop an improved system for managing the country's scientific research". The study will analyze the existing system of science planning, identify its weaknesses, determine the directions in which the country's R&D should be channeled, and recommend means for implementing its findings. The study is to cover such questions as: "What are the optimum expenditures for basic research, applied research and scien-

tific education?"; "What is the ideal size of a research institute, and What are the ideal proportions of large and small institutes?"; "How can the results of research be measured?"; "Should research managers be appointed for life or for fixed terms?".

175. Burton, R.A., "Expanding Technology Centers in the Consiglio Nazionale Delle Richerche (CNR)", European Scientific Notes, v. 22, no. 5, Office of Naval Research, London, 31 May 1968, pp. 126-127.

Italy is rapidly expanding its research facilities under a $2.1 million five-year plan extending from 1966 to 1970. Whereas CNR centers in the past have been closely associated with universities, and sometimes dominated by them, many of the new CNR centers will be independent under the new program. As for CNR itself, its president is elected by a council of ministers and is served by a five-man administrative board under which there are "as many committees as there are traditional disciplines". These committees decide how funds will be allocated among the laboratories, groups, and centers.

176. "Education and Science in 1967", Report of the Department of Education and Science, Presented to Parliament by the Secretary of State for Education and Science, by Command of Her Majesty, Her Majesty's Stationery Office, London, March 1968, 161 pp.

One of the six sections of this annual report is on civil science in the United Kingdom. The section opens with a general account of the Department of Education and Science's responsibilities in the area, followed by a short financial statement showing the distribution of 1967-68 funds (£73.8 million) to the five research councils and the two Royal Societies. The purpose and organization of the councils (Agricultural, Medical, Natural Environment, Science, and Social Science Research Councils) is described, and the major accomplishments and programs of each are cited. A more lengthy account is presented of the acitivities of the Council for Scientific Policy, which advises on the "broad distribution of the allocation of funds". Scientific manpower data are presented and key developments (brain drain, and decreasing proportion of students entering science and mathematics) are cited. The report concludes with a summary of U.K.'s activities in the foreign and international areas and a lengthy recitation of the programs of the Office for Scientific and Technical Information.

177. "Second Peru-U.S. Workshop on Science and Technology in Economic Development", Vol. I Report and Recommendations (62 pp.), Vol. II Contributed Papers (308 pp.), National Academy of Sciences, Washington, D.C., 20-24 November 1967.

This report presents the proceedings of the latest workshop meeting between the U.S. and Peru, which has the objective of developing "an organizational structure and policy necessary to accelerate scientific and technological progress essential for Peruvian development". The workshop is part of a science-cooperation program between the National Academy of Sciences and the Academia Nacional de Ciencias of Peru. Volume I of the report records the topics discussed and the conclusions reached at the workshop; this includes session reports and recommendations on the organization of research, science in education, government and industry responsibilities, and Peruvian scientific manpower needs. Volume II is a collection of papers presented on these topics during the workshop.

178. "Science and Brazilian Development", Report of the Second Workshop on Contributions of Science and Technology to Development, National Academy of Sciences, Washington, D.C., 5-9 February 1968, 102 pp.

"This report records the issues discussed and the conclusions reached at the Second U.S.-Brazil Workshop on Contributions of Science and Technology to Development". The workshop is part of a science-cooperation program between the National Academy of Sciences and the Brazilian National Research Council; its objective is to "consider mechanisms for facilitating and accelerating scientific progress as well as using science and technology in the development process". Following an address by Alvin Weinberg on "nuclear-powered agro-industrial complexes", study groups presented progress reports in several previously-selected problem areas. This was followed by a two-part science policy seminar: one part was devoted to Brazil's science and technology goals, plans, institutions, and policy-making process; the other discussed U.S. science policy "with particular attention to aspects relevant to Brazil".

179. "Report of the Colombia-U.S. Workshop on Science and Technology in Development", Vol. I Report and Recommendations (55 pp.), Vol. II Contributed Papers (98 pp.), National Academy of Sciences, Washington, D.C., February 26-March 1, 1968.

This report presents the proceedings of the Colombia-U.S. workshop on science held in Fusagasuga, Colombia. The workshop considered: (1) the current state of research in Colombia; (2) "mechanisms to strengthen, organize and direct Colombian science toward the solution of the country's economic and social problems"; (3) "ways to create

public awareness and interest in the role of science and technology in economic growth"; and (4) "possible plans for future collaborative action in the application of science and technology to Colombian development". Volume I is a record of the topics discussed and the conclusions reached at the workshop; Volume II is a collection of papers presented on the above topics during the workshop.

180. Laidler, K., "A Profile of the Present, of Reorganization Plans, and What They Augur", Research Management, v. 11, no. 4, 1968, pp. 241-247.

This article describes, in general terms, the present status of Polish industrial R&D, obstacles to greater R&D effectiveness, and some reforms. The author, who is Vice President of the Committee for Science and Technology (a prime policy-making body) refers to Poland's technology gap, a major symptom of which is the high and rising level of imported technology. Manpower resources in industrial R&D are cited (110,000 including "25,000 academically qualified scientists and engineers"), and some modes of R&D organization and coordination are briefly described. Obstacles "to higher effectiveness of R&D" include an "[a]cademic approach to industrial problems", shortage of scientific instruments, and lack of incentives for companies "to introduce Polish techniques or products". Among the reforms planned or effected are: contracts between the manufacturing companies and R&D groups; more money for exploratory R&D; formation of multidisciplinary teams; and special incentives for companies to use the results of R&D.

181. Carter, L.J., "Canadian Science Policy: Doubts Raised about Advisory Apparatus", Science, v. 161, no. 3840, 2 August 1968, pp. 450-451.

This article describes the Canadian science policy advisory apparatus and discusses whether it can give the government objective advice on science policy matters. The apparatus consists of (i) the Science Council, made up of scientists and engineers appointed by the Prime Minister from universities, industry, and ... government scientific agencies", (ii) the Science Secretariat, "a part of the government's Privy Council Office which provides staff support for the Science Council as well as for the Prime Minister and his cabinet". Questions, and some skepticism, about this advisory apparatus were raised in recent Senate hearings before the Science Policy Committee; the concern centered on the workability of the Council-Secretariat relationship and the problem of establishing priorities on which government science policy should be based. With "controversial projects such as ING

bidding for funds and scarce technical manpower" -- coupled with a national goal of doubling its spending on R&D by 1975 -- "Canada's science policy machinery faces major tests".

182. Science Policy and Organization of Research in Japan, No. 8, Science Policy Studies and Documents, United Nations Educational, Scientific and Cultural Organization, 1967, 86 pp.

This report, commissioned by Unesco, describes Japan's national science policy. The report is divided into six parts: historical background of the development of scientific and technological activities in Japan; current administrative organization of scientific activities; funding and expenditure on research; technical manpower and utilization; objectives of policy for science and technology; and annual socio-economic factors related to objectives and policies. The report, prepared by Japan's Science and Technology Agency, presents extensive statistical data on these topics. (Previous studies in this series include reports of the science policies of Belgium, Czechoslovakia, countries of South and South-East Asia, Norway, and the U.S.S.R., as well as two general studies: "Principles and Problems of National Science Policies", and "Structural and Operational Schemes of National Science Policy").

183. "Japanese Appropriations for Science and Technology in Fiscal 1968", International Science Notes, no. 20, August 1968, pp. 4-5.

Government appropriations for Japanese R&D in FY 1968 are presented, along with data on major allocation are Appropriations in 1968 increased by more than 14 perce over 1967 for a total of $533 million. This percentag increase, which was about the same as that between 196 and 1967, was far short of the large increase recommende by the "White Paper on Science and Technology". Of the total estimated R&D expenditures of $1.8-1.9 billion, the government contributed about 30 percent and private industry most of the remainder. The major government allocations are to universities and affiliated research institutes ($258 million), 83 laboratories in various government ministries ($96 million), atomic energy R&D ($56 million), defense ($24 million), and space ($20 million). Brief explanatory comments are presented for the university, atomic energy, and space research allocations.

184. Ram, A., "Role of Science in a Developing Society", India & Foreign Review, v. 5, no. 1, 1 March 1968, pp. 9-10.

The author, who is Director General of India's Council of Scientific and Industrial Research, discusses India's

objectives in supporting science and technology and their roles in economic development. India's problems of poverty and population can only be dealt with by economic growth, according to the author. For this reason, the test for R&D "is the extent to which it is put to use in productive enterprise". And for the same reason, greater emphasis must be placed on technology than on science. The author calls for a "technology policy ... which will link the country's science and industrial policy" and discusses some of the factors such a policy would have to consider. A development strategy for India is outlined that includes a "survey of the physical resources and their exploitation, encouragement to capital formation and enterprise and development of human resources". In connection with the latter, the author foresees a continuation of the brain drain until it is ultimately stopped by India's own "economic growth".

185. "Supranational Agency Pushed for European Space Efforts", Aviation Week & Space Technology, v. 89, no. 3, 15 July 1968, p. 45.

The establishment of a supranational European space authority has been endorsed by the German minister for scientific research, Dr. Gerhard Stoltenberg. 'Our aim must be to merge the European space organizations ... into a single body'. Under his plan, member states could choose 'to participate in one, two, or three areas of the program -- research satellites, applications satellites and launcher development'. In endorsing the space authority, which had been recommended at the recent European Space Conference, Stoltenberg urged U.S.-European cooperation in launch vehicles. U.S. participation, by helping to reduce the cost to member nations, could influence Great Britain to return to the ELDO program. "Stoltenberg said that if other nations follow Britain's lead in rejecting pan-European applications satellite and launcher development, present cooperation in research would also be jeopardized": 'This would be a cardinal error, which would probably be irreversible'.